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**Olefin polymerisation catalyst for (homo-) copolymer of olefin(s) - comprises transition metal compounds, titanium containing catalyst, aluminiumoxy compound, boric acid derivative, ion pair forming compound and organic metal compound**

**Patent Assignee:** MITSUI CHEM INC; MITSUI CHEM IND CO LTD; MITSUI PETROCHEM IND CO LTD; MITSUI PETROCHEMICAL IND LTD

**Inventors:** BAN K; HAYASHI T; MATSUNAGA S; SUGIMURA K; SUZUKI N; SUZUKI Y; YOROZU K

**Patent Family (19 patents, 11 countries)**

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
WO 1997038024	A1	19971016	WO 1997JP1217	A	19970409	199747	B
JP 9278823	A	19971028	JP 199686698	A	19960409	199802	E
JP 9278824	A	19971028	JP 199686699	A	19960409	199802	E
JP 9278949	A	19971028	JP 199688658	A	19960410	199802	E
JP 9278950	A	19971028	JP 199688659	A	19960410	199802	E
EP 893455	A1	19990127	EP 1997915685	A	19970409	199909	E
			WO 1997JP1217	A	19970409		
CN 1219177	A	19990609	CN 1997194688	A	19970409	199941	E
US 6136743	A	20001024	WO 1997JP1217	A	19970409	200055	E
			US 1998155876	A	19981007		
KR 2000005320	A	20000125	WO 1997JP1217	A	19970409	200061	E
			KR 1998708036	A	19981009		
KR 307031	B	20010924	KR 1998708036	A	19981009	200233	E
			KR 2001702934	A	20010307		
KR 307032	B	20010924	KR 1998708036	A	19981009	200233	E
			KR 2001702935	A	20010307		
KR 311595	B	20011217	WO 1997JP1217	A	19970409	200249	E
			KR 1998708036	A	19981009		
CN 1439657	A	20030903	CN 1997194688	A	19970409	200380	E
			CN 2003106041	A	19970409		
EP 893455	B1	20041006	EP 1997915685	A	19970409	200466	E
			WO 1997JP1217	A	19970409		
DE 69731081	E	20041111	DE 69731081	A	19970409	200474	E
			EP 1997915685	A	19970409		

			WO 1997JP1217	A	19970409		
CN 1105730	C	20030416	CN 1997194688	A	19970409	200538	E
DE 69731081	T2	20051006	DE 69731081	A	19970409	200566	E
			EP 1997915685	A	19970409		
			WO 1997JP1217	A	19970409		
JP 3749756	B2	20060301	JP 199686698	A	19960409	200617	E
CN 1178962	C	20041208	CN 2003106041	A	19970409	200618	E

**Priority Application Number (Number Kind Date):** JP 199686698 A 19960409; JP 199686699 A 19960409; JP 199688658 A 19960410; JP 199688659 A 19960410

### Patent Details

Patent Number	Kind	Language	Pages	Drawings	Filing Notes
WO 1997038024	A1	JA	159	1	
National Designated States,Original	CA CN KR SG US				
Regional Designated States,Original	DE FR GB IT NL				
JP 9278823	A	JA	34	0	
JP 9278824	A	JA	29	0	
JP 9278949	A	JA	31	0	
JP 9278950	A	JA	30	0	
EP 893455	A1	EN			PCT Application WO 1997JP1217
					Based on OPI patent WO 1997038024
Regional Designated States,Original	DE FR GB IT NL				
US 6136743	A	EN			PCT Application WO 1997JP1217
					Based on OPI patent WO 1997038024
					PCT Application

KR 2000005320	A	KO	1	WO 1997JP1217
				Based on OPI patent WO 1997038024
KR 307031	B	KO		Division of application KR 1998708036
KR 307032	B	KO		Division of application KR 1998708036
KR 311595	B	KO		PCT Application WO 1997JP1217
				Previously issued patent KR 2000005320
				Based on OPI patent WO 1997038024
CN 1439657	A	ZH		Division of application CN 1997194688
EP 893455	B1	EN		PCT Application WO 1997JP1217
				Based on OPI patent WO 1997038024
Regional Designated States,Original	DE FR GB IT NL			
DE 69731081	E	DE		Application EP 1997915685
				PCT Application WO 1997JP1217
				Based on OPI patent EP 893455
				Based on OPI patent WO

				1997038024
DE 69731081	T2	DE		Application EP 1997915685
				PCT Application WO 1997JP1217
				Based on OPI patent EP 893455
				Based on OPI patent WO 1997038024
JP 3749756	B2	JA	54	Previously issued patent JP 09278823

**Alerting Abstract:** WO A1

An olefin polymerisation catalyst comprises (a) (a-1) a Group (IV) transition metal compound containing ligands having cyclopentadienyl skeletons; (a-2) a titanium catalyst containing magnesium, titanium or halogen; (b) a Group VIII or X transition metal compound of formula (I), where M = Group VIII or Group X transition metal; X1, X2 = N or P; R1, R2 = H or a hydrocarbon; m, n = 1 or 2, each satisfies the valence of X1 or X2 respectively; R3 = a group combining X1 and X2, and is selected from =C(R6)-C(R7)=, =C(R6)-C(R72)(R71)-, -C(R62)(R61)-C(R72)(R71)- and -C(R6)=C(R7)-; R6, R7, R61, R62, R71 and R72 = H or hydrocarbon, R4, R5 = H, halogen, hydrocarbon, -OR8, -SR9, -N(R10)2 or -P(R11)2; R8-R11 = alkyl, cycloalkyl, aryl, aralkyl or organic silyl; R10, R11 can combine to form a ring. Two of R1, R2, R6 and R7 can combine to form a ring; (c) (c-1) organic Al-oxy compound; (c-2) alkyl boric acid derivative; or (c-3) a compound forming ion pairs by reacting with transition metal compounds; and (d) organic metal compound.

ADVANTAGE - The polymer compositions have good mechanical characteristics, and heat resistance.

**International Classification (Main):** C08F-004/00, C08F-004/70, C08L-023/00

**International Patent Classification**

IPC	Level	Value	Position	Status	Version
C08F-0010/00	A	I	L	B	20060101
C08F-0010/00	A	I	L	R	20060101
C08F-0010/00	A	I		R	20060101
C08F-0110/06	A	N		R	20060101
C08F-0210/16	A	N		R	20060101
C08F-0004/00	A	I		R	20060101
C08F-0004/26	A	I	L	R	20060101

C08F-0004/60	A	I	L	R	20060101
C08F-0004/642	A	I	F	R	20060101
C08F-0004/654	A	I	F	R	20060101
C08F-0004/659	A	I	L	R	20060101
C08F-0004/6592	A	I	L	R	20060101
C08F-0004/70	A	I	F	B	20060101
C08F-0004/70	A	I	L	R	20060101
C08F-0004/70	A	I		R	20060101
C08L-0023/00	A	I	F	R	20060101
C08L-0023/02	A	I		R	20060101
C08L-0023/06	A	I		R	20060101
C08L-0023/08	A	I		R	20060101
C08L-0023/16	A	N		R	20060101
C08F-0010/00	C	I	L	B	20060101
C08F-0010/00	C	I	L	R	20060101
C08F-0010/00	C	I		R	20060101
C08F-0110/00	C	N		R	20060101
C08F-0210/00	C	N		R	20060101
C08F-0004/00	C	I	F	B	20060101
C08F-0004/00	C	I	L	R	20060101
C08F-0004/00	C	I		R	20060101
C08L-0023/00	C	I	F	R	20060101
C08L-0023/00	C	I		R	20060101

**US Classification, Issued:** 502-113000

**US Classification, Issued:** 502-108000, 502-117000, 525-268000, 525-270000, 526-114000, 526-116000, 526-119000

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#### China

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Publication Date: 20030416

Assignee: MITSUI CHEM IND CO LTD; JP (MITA)

Language: ZH

Application: CN 1997194688 A 19970409 (Local application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP 199688659 A 19960410

Current IPC: C08F-10/00(R,I,M,EP,20060101,20051008,A) C08F-10/00

(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06

(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16  
(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70  
(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02  
(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08  
(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)  
Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2  
Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN  
M08F-210:16+M08F210/06+VIS+LDEN+MWDN M08F-210:16+M08F210/08+VIS+LDEN+MWDN  
M08F-210:16+M08F210/14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN  
M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN  
M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06|CN 1178962 C (Update 200618 E)  
Publication Date: 20041208  
Assignee: MITSUI CHEM INC; JP (MITA)  
Inventor: SUGIMURA K BAN K SUZUKI N  
Language: ZH  
Application: CN 2003106041 A 19970409 (Local application)  
Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP  
199688659 A 19960410  
Original IPC: C08F-10/00(A) C08L-23/00(B)  
Current IPC: C08F-10/00(R,A,I,M,EP,20060101,20051008,A) C08F-10/00  
(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06  
(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16  
(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70  
(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02  
(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08  
(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)  
Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2  
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M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06|CN 1219177 A (Update 199941 E)  
Publication Date: 19990609  
Assignee: MITSUI CHEM IND CO LTD; JP (MITA)  
Language: ZH  
Application: CN 1997194688 A 19970409 (Local application)  
Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP  
199688659 A 19960410  
Original IPC: C08F-4/70(A) C08F-10/00(B) C08L-23/02(B)  
Current IPC: C08F-10/00(R,A,I,M,EP,20060101,20051008,A) C08F-10/00  
(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06  
(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16  
(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70  
(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02  
(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08  
(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)  
Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2  
Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN  
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M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN

M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06|CN 1439657 A (Update 200380 E)

Publication Date: 20030903

Assignee: MITSUI CHEM INC; JP (MITA)

Language: ZH

Application: CN 1997194688 A 19970409 (Division of application) CN 2003106041 A 19970409 (Local application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP

199688659 A 19960410

Original IPC: C08F-10/00(A) C08L-23/00(B)

Current IPC: C08F-10/00(R,A,I,M,EP,20060101,20051008,A) C08F-10/00

(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06

(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16

(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70

(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02

(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08

(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)

Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2

Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN

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M08F-210:16+M08F210/14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN

M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN

M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06

### Germany

Publication Number: DE 69731081 E (Update 200474 E)

Publication Date: 20041111

**\*\*OLEFIN-POLYMERISATIONSKATALYSATOR, OLEFIN-POLYMERISATIONEN VERFAHREN, OLEFIN-POLYMERZUSAMMENSETZUNGEN UND IN DER WAAAARME GEFORMTE GEGENSTAAANDE\*\***

Assignee: MITSUI CHEM INC; JP (MITA)

Language: DE

Application: DE 69731081 A 19970409 (Local application) EP 1997915685 A 19970409 (Application)

WO 1997JP1217 A 19970409 (PCT Application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP

199688659 A 19960410

Related Publication: EP 893455 A (Based on OPI patent ) WO 1997038024 A (Based on OPI patent )

|DE 69731081 T2 (Update 200566 E)

Publication Date: 20051006

Assignee: MITSUI CHEM INC; JP (MITA)

Inventor: SUGIMURA K YOROZU K SUZUKI Y HAYASHI T MATSUNAGA S

Language: DE

Application: DE 69731081 A 19970409 (Local application) EP 1997915685 A 19970409 (Application)

WO 1997JP1217 A 19970409 (PCT Application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP

199688659 A 19960410

Related Publication: EP 893455 A (Based on OPI patent ) WO 1997038024 A (Based on OPI patent )

Original IPC: C08F-4/70(A) C08F-10/00(B) C08L-23/02(B)

Current IPC: C08F-4/70(A) C08F-10/00(B) C08L-23/02(B)

Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2

Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN

M08F-210:16+M08F210/06+VIS+LDEN+MWDN M08F-210:16+M08F210/08+VIS+LDEN+MWDN

M08F-210:16+M08F210:14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN  
 M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN  
 M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06

### European Patent Office

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**\*\*OLEFIN-POLYMERISATIONSKATALYSATOR, OLEFIN-POLYMERISATIONS VERFAHREN, OLEFIN-POLYMERZUSAMMENSETZUNGEN UND IN DER WARME GEFORMTE GEGENSTANDE OLEFIN POLYMERIZATION CATALYST, OLEFIN POLYMERIZATION METHOD, OLEFIN POLYMER COMPOSITIONS, AND THERMOFORMED ARTICLES CATALYSEUR DE POLYMERISATION D'OLEFINES, PROCEDE DE POLYMERISATION D'OLEFINES, COMPOSITIONS DE POLYMERES D'OLEFINES ET ARTICLES THERMOFORMES\*\***

Assignee: Mitsui Chemicals, Inc., 2-5, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100, JP (MITA)

Inventor: SUGIMURA, Kenji, Mitsui Chemicals, Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP YOROZU, Kiyotaka, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP SUZUKI, Yasuhiko, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP HAYASHI, Tetsuo, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP MATSUNAGA, Shin-ya, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP

Agent: HOFFMANN - EITLE, Patent- und Rechtsanwaelte Arabellastrasse 4, 81925 Muenchen, DE  
 Language: EN

Application: EP 1997915685 A 19970409 (Local application) WO 1997JP1217 A 19970409 (PCT Application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP 199688659 A 19960410

Related Publication: WO 1997038024 A (Based on OPI patent )

Designated States: (Regional Original) DE FR GB IT NL

Original IPC: C08F-4/70(A) C08F-10/00(B) C08L-23/02(B)

Current IPC: C08F-10/00(R,I,M,EP,20060101,20051008,A) C08F-10/00

(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06

(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16

(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70

(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02

(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08

(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)

Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2

Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN  
 M08F-210:16+M08F210:06+VIS+LDEN+MWDN M08F-210:16+M08F210:08+VIS+LDEN+MWDN  
 M08F-210:16+M08F210:14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN  
 M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN  
 M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06

Original Abstract: The invention provides catalysts which have a high polymerization activity, enable the obtaining of olefin polymers of wide molecular weight distribution, and which comprise (a)(a-1) a metallocene compound or (a-2) a titanium catalyst component containing magnesium, titanium, and halogen, (b) a compound of a transition metal from Groups 8 to 10 of the periodic table and is of the general formula shown below, and a cocatalyst component. \*(formula 03)\* The invention also provides olefin polymer compositions excellent in rigidity and impact resistance which can be produced using a catalyst comprising the transition metal compound (b) and which comprise a non-crystalline olefin polymer having a specific intrinsic viscosity, glass transition temperature and density, and another



known olefin polymer. The present invention also provides olefin polymer compositions excellent in mechanical characteristics and heat resistance which can be produced using a catalyst comprising the transition metal compound (b) and which comprise a crystalline olefin polymer having a specific intrinsic viscosity, melting point and density, and another known olefin polymer.

Claim: 1. An olefin polymerization catalyst comprising: (a) (a-1) a compound of a transition metal from Group 4 of the periodic table, which contains a ligand having a cyclopentadienyl skeleton, or (a-2) a titanium catalyst component containing magnesium, titanium, and halogen, (b) a compound of a transition metal from any of Groups 8 to 10 of the periodic table, expressed by the general formula (I) below, (c) at least one compound selected from among (c-1) organic aluminum oxycompounds, (c-2) alkylboronic acid derivatives, and (c-3) compounds reacting with the transition metal compound to form an ion pair, and if necessary, \* (d) an organometallic compound:[0198.0001]wherein M indicates a transition metal atom from any of Groups 8 to 10 of the periodic table, X1 and X2 may be the same as or different from each other and are each a nitrogen atom or a phosphorus atom, R1 and R2 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group, m and n may be the same as or different from each other and are each a value of 1 or 2 that satisfies the valence of X1 and X2, respectively, R3 is a group that binds X1 and X2 and indicates[0199.0001](where R6, R7, R61, R62, R71, and R72 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group), R4 and R5 may be the same as or different from each other and are each a hydrogen atom, halogen atom, hydrocarbon group, -OR8, -SR9, -N(R10)2, or -P(R11)2 (where each of R8 to R11 indicates an alkyl group, cycloalkyl group, aryl group, aralkyl group, or organic silyl group, the groups R10 may be bonded mutually to form a ring, and the groups R11 may be bonded mutually to form a ring), R4 and R5 may be bonded to each other to form a ring, and two or more among R1, R2, R6 (or R61, R62), and R7 (or R71, R72) may be bonded to each other to form a ring. |EP 893455 B1 (Update 200466 E)

Publication Date: 20041006

**\*\*OLEFIN-POLYMERISATIONSKATALYSATOR, OLEFIN-POLYMERISATIONEN VERFAHREN, OLEFIN-POLYMERZUSAMMENSETZUNGEN UND IN DER WARME GEFORMTE GEGENSTANDE OLEFIN POLYMERIZATION CATALYST, OLEFIN POLYMERIZATION METHOD, OLEFIN POLYMER COMPOSITIONS, AND THERMOFORMED ARTICLES CATALYSEUR DE POLYMERISATION D'OLEFINES, PROCEDE DE POLYMERISATION D'OLEFINES, COMPOSITIONS DE POLYMERES D'OLEFINES ET ARTICLES THERMOFORMES\*\***

Assignee: Mitsui Chemicals, Inc., 2-5, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100, JP (MITA)

Inventor: SUGIMURA, Kenji, Mitsui Chemicals, Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP YOROZU, Kiyotaka, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP SUZUKI, Yasuhiko, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP HAYASHI, Tetsuo, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP MATSUNAGA, Shin-ya, Mitsui Chemicals Inc., 1-2, Waki 6-chome, Waki-cho, Kuga-gun, Yamaguchi 740, JP

Agent: HOFFMANN - EITLE, Patent- und Rechtsanwälte, Arabellastrasse 4, 81925 Munchen, DE  
Language: EN

Application: EP 1997915685 A 19970409 (Local application) WO 1997JP1217 A 19970409 (PCT Application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP 199688659 A 19960410

Related Publication: WO 1997038024 A (Based on OPI patent )

Designated States: (Regional Original) DE FR GB IT NL

Current IPC: C08F-10/00(R,I,M,EP,20060101,20051008,A) C08F-10/00

(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06

(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16

(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70

(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02

(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08

(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)

Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2

Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN

M08F-210:16+M08F210/06+VIS+LDEN+MWDN M08F-210:16+M08F210/08+VIS+LDEN+MWDN

M08F-210:16+M08F210/14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN

M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN

M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06

Claim: 1.Olefin-Polymerisationskatalysator, umfassend: \* (a) \* (a-1) eine Verbindung eines Übergangsmetalls der Gruppe 4 des Periodensystems, die einen Liganden mit einem Cyclopentadienylgerüst enthält, oder \* (a-2) eine Titan-Katalysatorkomponente, enthaltend Magnesium, Titan und Halogen, \* (b) eine Verbindung eines Übergangsmetall aus irgendeiner der Gruppen 8 bis 10 des Periodensystems, ausgedrückt durch die unten angegebene allgemeine Formel (I), \* (c) wenigstens eine Verbindung, ausgewählt aus (c-1) organischen Aluminiumoxyverbindungen, (c-2)

Alkylboronsäurederivaten und (c-3) Verbindungen, die mit der Übergangsmetallverbindung reagieren, wodurch ein Ionenpaar gebildet wird, und wenn notwendig, \* (d) eine metallorganische Verbindung:[CF 0205.0001] worin M ein Übergangsmetallatom aus irgendeiner der Gruppen 8 bis 10 des Periodensystems bedeutet, \* X1 und X2 können gleich oder verschieden voneinander sein und sind je weils ein Stickstoffatom oder ein Phosphoratom, \* R1 und R2 können gleich oder verschieden voneinander sein und sind je weils ein Wasserstoffatom oder eine Kohlenwasserstoffgruppe, \* m und n können gleich oder verschieden voneinander sein und sind jeweils ein Wert von 1 oder 2, der der Valenz von X1 bzw. X2 genügt, \* R3 ist eine Gruppe, die X1 und X2 bindet, und[CF 0206.0001]bedeutet (worin R6, R7, R61, R62, R71 und R72 gleich oder verschieden voneinander sein können und jeweils ein Wasserstoffatom oder eine Kohlenwasserstoffgruppe sind), \* R4 und R5 können gleich oder verschieden voneinander sein und sind je weils ein Wasserstoffatom, Halogenatom, eine Kohlenwasserstoffgruppe, -OR8, -SR9, -N(R10)2 oder -P(R11)2 (worin jeder von R8 bis R11 eine Alkylgruppe, Cycloalkylgruppe, Arylgruppe, Aralkylgruppe oder organische Silylgruppe bedeutet, die Gruppen R10 können beiderseitig gebunden sein, wodurch ein Ring gebildet wird, und die Gruppen R11 können beiderseitig gebunden sein, wodurch ein Ring gebildet wird), R4 und R5 können aneinander gebunden sein, wodurch ein Ring gebildet wird, und zwei oder mehrere unter R1, R2, R6 (oder R61, R62) und R7 (oder R71, R72) können aneinander gebunden sein, wodurch ein Ring gebildet wird. 1.An olefin polymerization catalyst comprising: \* (a) \* (a-1) a compound of a transition metal from Group 4 of the periodic table, which contains a ligand having a cyclopentadienyl skeleton, or \* (a-2) a titanium catalyst component containing magnesium, titanium, and halogen, \* (b) a compound of a transition metal from any of Groups 8 to 10 of the periodic table, expressed by the general formula (I) below, \* (c) at least one compound selected from among (c-1) organic aluminum oxycompounds, (c-2) alkylboronic acid derivatives, and (c-3) compounds reacting with the transition metal compound to form an ion pair, and if necessary, \* (d) an organometallic compound:[CF 0198.0001] wherein M indicates a transition metal atom from any of Groups 8 to 10 of the periodic table, \* X1 and X2 may be the same as or different from each other and are each a nitrogen atom or a phosphorus atom, \* R1 and R2 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group, \* m and n may be the same as or different from each other and are each a value of 1 or 2 that satisfies the valence of X1 and X2, respectively, \* R3 is a group that binds X1 and X2 and indicates[CF 0199.0001](where R6, R7, R61, R62, R71, and R72 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group), \* R4 and R5 may be the same as or different from each other and are each a hydrogen atom, halogen atom, hydrocarbon group, -OR8, -SR9, -N(R10)2, or -P(R11)2 (where each of R8 to R11 indicates an alkyl group, cycloalkyl group, aryl group, aralkyl group, or organic silyl group, the groups R10 may be bonded mutually to form a ring, and the groups R11 may be bonded mutually to form a ring), R4 and R5 may be bonded to each other to form a ring, and

\* two or more among R1, R2, R6 (or R61, R62), and R7 (or R71, R72) may be bonded to each other to

form a ring. 1. Catalyseur de polymerisation d'olefines comprenant: \* (a) \* (a-1) un compose d'un metal de transition du groupe 4 du tableau periodique, qui contient un ligand ayant un squelette cyclopentadieny le, ou \* (a-2) un composant de catalyseur de titane contenant du magnesium, du titane et un halogene, \* (b) un compose d'un metal de transition de l'un quelconque des groupes 8 a 10 du tableau periodique, represente par la formule generale (I) ci-dessous, \* (c) au moins un compose choisi parmi (c-1) les oxycomposes d'aluminium organiques, (c-2) les derives d'acide alkylboronique et (c-3) les composés reagissant avec le compose de metal de transition pour former une paire d'ions et, le cas échéant, \* (d) un compose organometallique: [CF 0212.0001] \* dans laquelle M represente un atome de metal de transition de l'un quelconque des groupes 8 a 10 du tableau periodique, \* X1 et X2 peuvent être identiques ou différents l'un de l'autre et sont chacun un atome d'azote ou un atome de phosphore, \* R1 et R2 peuvent être identiques ou différents l'un de l'autre et sont chacun un atome d'hydrogene ou un groupe hydrocarboné, \* m et n peuvent être identiques ou différents l'un de l'autre et sont chacun une valeur de 1 ou 2 qui satisfait la valence respectivement de X1 et X2, \* R3 est un groupe qui lie X1 et X2 et qui represente [CF 0213.0001] (ou R6, R7, R61, R62, R71 et R72 peuvent être identiques ou différents les uns des autres et sont chacun un atome d'hydrogene ou un groupe hydrocarboné), \* R4 et R5 peuvent être identiques ou différents l'un de l'autre et sont chacun un atome d'hydrogene, un atome d'halogene, un groupe hydrocarboné, -OR8, -SR9, -N(R10) ou -P(R11)2 (ou chacun des R8 a R11 represente un groupe alkyle, un groupe cycloalkyle, un groupe aryle, un groupe aralkyle, un groupe silyle organique, les groupes R10 peuvent être liés mutuellement pour former un cycle, et les groupes R11 peuvent être liés mutuellement pour former un cycle), R4 et R5 peuvent être liés l'un a l'autre pour former un cycle, et \* deux radicaux ou plus parmi R1, R2, R6 (ou R61, R62), et R7 (ou R71, R72) peuvent être liés les uns aux autres pour former un cycle.

## Japan

Publication Number: JP 9278823 A (Update 199802 E)

Publication Date: 19971028

**\*\*OLEFIN POLYMERIZATION CATALYST AND METHOD OF POLYMERIZATION OF OLEFIN\*\***

Assignee: MITSUI PETROCHEM IND LTD (MITC)

Inventor: SUGIMURA KENJI YOROZU KIYOTAKA SUZUKI YASUHIKO HAYASHI TETSUO

Language: JA (34 pages, 0 drawings)

Application: JP 199686698 A 19960409 (Local application)

Original IPC: C08F-4/70(A) C08F-4/642(B) C08F-10/00(B)

Current IPC: C08F-10/00(R,A,I,M,JP,20060101,20060310,A,L) C08F-10/00

(R,I,M,JP,20060101,20060310,C,L) C08F-4/00(R,I,M,JP,20060101,20060310,C,L) C08F-4/60

(R,I,M,JP,20060101,20060310,A,L) C08F-4/642(R,I,M,JP,20060101,20060310,A,F) C08F-4/659

(R,I,M,JP,20060101,20060310,A,L) C08F-4/6592(R,I,M,JP,20060101,20060310,A,L) C08F-4/70

(R,I,M,JP,20060101,20060310,A,L)|JP 9278824 A (Update 199802 E)

Publication Date: 19971028

**\*\*OLEFIN POLYMERIZATION CATALYST AND METHOD OF POLYMERIZATION OF OLEFIN\*\***

Assignee: MITSUI PETROCHEM IND LTD (MITC)

Inventor: SUGIMURA KENJI YOROZU KIYOTAKA SUZUKI YASUHIKO HAYASHI TETSUO

Language: JA (29 pages, 0 drawings)

Application: JP 199686699 A 19960409 (Local application)

Original IPC: C08F-4/70(A) C08F-4/654(B) C08F-10/00(B)

Current IPC: C08F-10/00(R,A,I,M,JP,20060101,20051220,A,L) C08F-10/00

(R,I,M,JP,20060101,20051220,C,L) C08F-4/00(R,I,M,JP,20060101,20051220,C,L) C08F-4/60

(R,I,M,JP,20060101,20051220,A,L) C08F-4/654(R,I,M,JP,20060101,20051220,A,F) C08F-4/70

(R,I,M,JP,20060101,20051220,A,L)|JP 9278949 A (Update 199802 E)

Publication Date: 19971028

**\*\*OLEFIN POLYMER COMPOSITION\*\***

Assignee: MITSUI PETROCHEM IND LTD (MITC)

Inventor: MATSUNAGA SHINYA SUGIMURA KENJI YOROZU KIYOTAKA

Language: JA (31 pages, 0 drawings)

Application: JP 199688658 A 19960410 (Local application)

Original IPC: C08L-23/00(A) C08F-4/26(B) C08F-10/00(B)

Current IPC: C08F-10/00(R,A,I,M,JP,20060101,20051220,A,L) C08F-10/00

(R,I,M,JP,20060101,20051220,C,L) C08F-4/00(R,I,M,JP,20060101,20051220,C,L) C08F-4/26

(R,I,M,JP,20060101,20051220,A,L) C08F-4/60(R,I,M,JP,20060101,20051220,A,L) C08L-23/00

(R,I,M,JP,20060101,20051220,A,F) C08L-23/00(R,I,M,JP,20060101,20051220,C,F)|JP 9278950 A  
(Update 199802 E)

Publication Date: 19971028

**\*\*OLEFIN POLYMER COMPOSITION\*\***

Assignee: MITSUI PETROCHEM IND LTD (MITC)

Inventor: MATSUNAGA SHINYA SUGIMURA KENJI YOROZU KIYOTAKA

Language: JA (30 pages, 0 drawings)

Application: JP 199688659 A 19960410 (Local application)

Original IPC: C08L-23/00(A) C08F-4/26(B)

Current IPC: C08F-10/00(R,A,I,M,JP,20060101,20051220,A,L) C08F-10/00

(R,I,M,JP,20060101,20051220,C,L) C08F-4/00(R,I,M,JP,20060101,20051220,C,L) C08F-4/26

(R,I,M,JP,20060101,20051220,A,L) C08F-4/60(R,I,M,JP,20060101,20051220,A,L) C08L-23/00

(R,I,M,JP,20060101,20051220,A,F) C08L-23/00(R,I,M,JP,20060101,20051220,C,F)|JP 3749756 B2  
(Update 200617 E)

Publication Date: 20060301

Assignee: MITSUI CHEM INC (MITA)

Language: JA (54 pages)

Application: JP 199686698 A 19960409 (Local application)

Related Publication: JP 09278823 A (Previously issued patent)

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(B,I,H,JP,20060101,20060209,C,F) C08F-4/70(B,I,H,JP,20060101,20060209,A,F)

Current IPC: C08F-10/00(B,I,H,JP,20060101,20060209,A,L) C08F-10/00

(B,I,H,JP,20060101,20060209,C,L) C08F-4/00(B,I,H,JP,20060101,20060209,C,F) C08F-4/60

(R,I,M,JP,20060101,20060310,A,L) C08F-4/642(R,I,M,JP,20060101,20060310,A,F) C08F-4/659

(R,I,M,JP,20060101,20060310,A,L) C08F-4/6592(R,I,M,JP,20060101,20060310,A,L) C08F-4/70

(B,I,H,JP,20060101,20060209,A,F)

**Republic of Korea**

Publication Number: KR 2000005320 A (Update 200061 E)

Publication Date: 20000125

Assignee: MITSUI CHEM INC (MITA)

Language: KO (1 drawings)

Application: WO 1997JP1217 A 19970409 (PCT Application) KR 1998708036 A 19981009 (Local application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP 199688659 A 19960410

Related Publication: WO 1997038024 A (Based on OPI patent )

Original IPC: C08F-4/00(A)

Current IPC: C08F-4/00(R,I,M,EP,20060101,20051110,A) C08F-4/00

(R,I,M,EP,20060101,20051110,C)|KR 307031 B (Update 200233 E)

Publication Date: 20010924

Assignee: MITSUI CHEM INC (MITA)

Language: KO

Application: KR 1998708036 A 19981009 (Division of application) KR 2001702934 A 20010307 (Local application)

Priority: JP 199688658 A 19960410

Original IPC: C08L-23/00(A)

Current IPC: C08L-23/00(A)|KR 307032 B (Update 200233 E)

Publication Date: 20010924

Assignee: MITSUI CHEM INC (MITA)

Language: KO

Application: KR 1998708036 A 19981009 (Division of application) KR 2001702935 A 20010307 (Local application)

Priority: JP 199688659 A 19960410

Original IPC: C08L-23/00(A)

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Publication Date: 20011217

Assignee: MITSUI CHEM INC (MITA)

Language: KO

Application: WO 1997JP1217 A 19970409 (PCT Application) KR 1998708036 A 19981009 (Local application)

Priority: JP 199686698 A 19960409 JP 199686699 A 19960409 JP 199688658 A 19960410 JP 199688659 A 19960410

Related Publication: KR 2000005320 A (Previously issued patent) WO 1997038024 A (Based on OPI patent )

Original IPC: C08F-4/00(A)

Current IPC: C08F-4/00(A)

### United States

Publication Number: US 6136743 A (Update 200055 E)

Publication Date: 20001024

**\*\*Olefin polymerization catalyst, olefins polymerization methods, and olefin polymer compositions, and heat molded products.\*\***

Assignee: Mitsui Chemicals, INC., Tokyo, JP (MITA)

Inventor: Sugimura, Kenji, Yamaguchi, JP Suzuki, Yasuhiko, Yamaguchi, JP Hayashi, Tetsuo, Yamaguchi, JP Matsunaga, Shin-ya, Yamaguchi, JP Yorozu, Kiyotaka, Yamaguchi, JP

Agent: Birch, Stewart, Kolasch Birch, LLP

Language: EN

Application: WO 1997JP1217 A 19970409 (PCT Application) US 1998155876 A 19981007 (Local application)

Related Publication: WO 1997038024 A (Based on OPI patent )

Original IPC: C08F-4/653(A) C08F-4/646(B)

Current IPC: C08F-10/00(R,I,M,EP,20060101,20051008,A) C08F-10/00

(R,I,M,EP,20060101,20051008,C) C08F-110/00(R,N,M,EP,20060101,20051008,C) C08F-110/06

(R,N,M,EP,20060101,20051008,A) C08F-210/00(R,N,M,EP,20060101,20051008,C) C08F-210/16

(R,N,M,EP,20060101,20051008,A) C08F-4/00(R,I,M,WO,20060101,20060521,C) C08F-4/70

(R,I,M,WO,20060101,20060521,A) C08L-23/00(R,I,M,EP,20060101,20051008,C) C08L-23/02

(R,I,M,EP,20060101,20051008,A) C08L-23/06(R,I,M,EP,20060101,20051008,A) C08L-23/08

(R,I,M,EP,20060101,20051008,A) C08L-23/16(R,N,M,EP,20060101,20051008,A)

Current ECLA class: C08F-10/00+4/70 C08L-23/02 C08L-23/06+B2 C08L-23/08A1+B2

Current ECLA ICO class: M08F-110:06+MWDN+VIS+LDEN M08F-110:06+VIS+LDEN+MWDN

M08F-210:16+M08F210/06+VIS+LDEN+MWDN M08F-210:16+M08F210/08+VIS+LDEN+MWDN

M08F-210:16+M08F210/14+VIS+LDEN+MWDN M08F-210:16+M08F210:06+MWDN+VIS+LDEN

M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN  
M08L-23:08A1 M08L-23:16B M08L-205:02 M08L-314:06

Current US Class (main): 502-113000

Current US Class (secondary): 502-108000 502-117000 525-268000 525-270000 526-114000 526-116000 526-119000

Original US Class (main): 502113

Original US Class (secondary): 502108 502117 526114 526116 526119 525268 525270

Original Abstract: The invention provides catalysts which have a high polymerization activity, enable the obtaining of olefin polymers of wide molecular weight distribution, and which comprise (a)(a-1) a metallocene compound or (a-2) a titanium catalyst component containing magnesium, titanium, and halogen, (b) a compound of a transition metal from Groups 8 to 10 of the periodic table and is of the general formula shown below, and a cocatalyst component. The invention also provides olefin polymer compositions excellent in rigidity and impact resistance which can be produced using a catalyst comprising the transition metal compound (b) and which comprises a non-crystalline olefin polymer having a specific intrinsic viscosity, glass transition temperature and density, and another known olefin polymer.

Claim: 1. An olefin polymerization catalyst comprising: \* (a) (a-1) a compound of a transition metal from Group 4 of the periodic table, which contains a ligand having a cyclopentadienyl skeleton, or \* (a-2) a titanium catalyst component containing magnesium, titanium, and halogen, \* (b) a compound of a transition metal from any of Groups 8 to 10 of the periodic table, expressed by the general formula (I) below, \* (c) at least one compound selected from among (c-1) organic aluminum oxycompounds, (c-2) alkylboronic acid derivatives, and (c-3) compounds reacting with the transition metal compound to form an ion pair, and if necessary, \* (d) an organometallic compound: \* wherein M indicates a transition metal atom from any of Groups 8 to 10 of the periodic table, \* X1 and X2 may be the same as or different from each other and are each a nitrogen atom or a phosphorus atom, \* R1 and R2 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group, \* m and n may be the same as or different from each other and are each a value of 1 or 2 that satisfies the valence of X1 and X2, respectively, \* R3 is a group that binds X1 and X2 and indicates \* (where R6, R7, R61, R62, R71, and R72 may be the same as or different from each other and are each a hydrogen atom or hydrocarbon group), \* R4 and R5 may be the same as or different from each other and are each a hydrogen atom, halogen atom, hydrocarbon group, --OR8, --SR9, --N(R10)2, or --P(R11)2 (where each of R8 to R11 indicates an alkyl group, cycloalkyl group, aryl group, aralkyl group, or organic silyl group, the groups R10 may be bonded mutually to form a ring, and the groups R11 may be bonded mutually to form a ring), R4 and R5 may be bonded to each other to form a ring, and \* two or more among R1, R2, R6 (or R61, R62), and R7 (or R71, R72) may be bonded to each other to form a ring.

## WIPO

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Publication Date: 19971016

**\*\*OLEFIN POLYMERIZATION CATALYST, OLEFIN POLYMERIZATION METHOD, OLEFIN POLYMER COMPOSITIONS, AND THERMOFORMED ARTICLES\*\***

Assignee: MITSUI PETROCHEMICAL INDUSTRIES, LTD., JP (MITC)

Inventor: SUGIMURA, KENJI, JP YOROZU, KIYOTAKA, JP SUZUKI, YASUHIKO, JP HAYASHI, TETSUO, JP MATSUNAGA S

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M08F-210:16+M08F210:08+MWDN+VIS+LDEN M08F-210:16+M08F210:14+MWDN+VIS+LDEN  
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Original Abstract: A catalyst having a high polymerization activity and capable of providing olefin polymers having a wide molecular weight distribution, which comprises (a) a metallocene compound (a-1) or a titanium catalyst component (a-2) comprising magnesium, titanium, and a halogen as indispensable components, (b) a group 8-10 transition metal compound represented by general formula (I'), and a cocatalyst, wherein M represents Pd, Ni, or Pt; X1 and X2 represent N or P; R1 and R2 represent H or a hydrocarbon radical; R4 and R5 represent a halogen or a hydrocarbon radical; and R6 and R7 represent H or a hydrocarbon radical. An olefin polymer composition which has excellent rigidity and impact resistance is prepared by using a catalyst containing the above transition metal compound (b), and comprises a noncrystalline olefin polymer having an intrinsic viscosity, a glass transition temperature, and a density in respective particular ranges and a conventional olefin polymer other than the above olefin polymer. Another olefin polymer composition which has excellent mechanical properties and heat resistance is prepared by using a catalyst containing the above transition metal compound (b), and comprises a crystalline olefin polymer having an intrinsic viscosity, a melting point, and a density in respective particular ranges and a conventional olefin polymer other than the above olefin polymer.

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